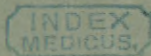


Lundy (C. J.)

✓ LIGHT IN THE PUBLIC SCHOOLS

AND

SCHOOL-LIFE IN RELATION TO VISION.



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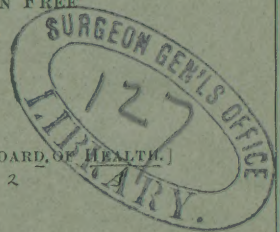
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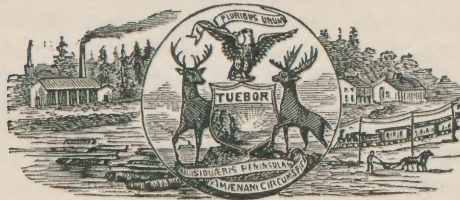
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LIGHT IN PUBLIC SCHOOLS, AND SCHOOL LIFE IN RELATION TO VISION.

BY PROF. C. J. LUNDY, M. D., OF DETROIT.

[Read at the Sanitary Convention in Detroit, Mich., January 7, 1880.]

LADIES AND GENTLEMEN:—School life and school hygiene are subjects replete with interest, and are well worthy the attention of the *savant* in the domain of sanitary science, and it is to be regretted that so little has been said or written upon a theme so important. When we consider the number of years spent at school, the long hours of study, and the important changes going on in the human economy in early life, it is certainly surprising that so little thought and attention have been given to subjects which so intimately concern the comfort and well-being of our children.

When we consider in how many instances eye-disease of an incurable character owes its origin to school-life, we cannot avoid the conclusion that modern education is not an unmixed blessing. When we observe the array of brilliant names whose possessors have done so much for the advancement of ophthalmic science, we may question whether the ounce of prevention has not sometimes been lost sight of in the eagerness to perform some dazzling cure.

That the prevention of disease is of paramount importance to its cure will be admitted as a fact, and this must be my apology for calling your attention briefly to some of the ill effects of school-life and the best means for their prevention. Many observations have been made regarding the influence which school-life exerts upon the visual organs and upon the eye-sight itself. These observations have been made at various places in Europe as well as in our own country; and while they show slight differences in some respects, the conclusions arrived at agree in all essential particulars. Indeed, we seldom see such uniform conclusions, drawn from observations made at points so widely distant and by so many different observers. These conclusions, based upon the examination of many thousand children, show beyond doubt that modern school-life, with its surrounding circumstances, is an important factor in producing serious and permanent changes in the eye, and consequent limitation of vision. Nor are these the only ill effects of school-life with bad hygienic surroundings, for the eye may suffer, though less seriously, in various other ways. Considered as optical instruments few eyes are perfect, and yet in a

majority of cases the defect is so slight that emmetropia (natural sight) is found in most young children. Slight optical defects cause comparatively little disturbance of vision in early youth, except after prolonged use of the eyes, or when the light is poor, or when the body is fatigued. Three forms of optical defect are found among children, viz.: hyperopia (far-sight), myopia (near-sight), and astigmatism.

We will consider very briefly the first of these, while the importance of the second demands something more than a passing notice. The hyperopic eye is one whose axis is too short, in consequence of which it becomes necessary, even for distant vision, to bring into play a part of the accommodative power of the eye through contraction of the ciliary muscle. Now, if distant objects are not seen distinctly unless by an effort of accommodation, it will require a strain upon the ciliary muscle, and also upon the internal recti muscles to enable the hyperopic eye to properly focus the image of near objects; and the nearer the object is brought the more divergent will be the rays of light proceeding from it, and the greater will be the strain required to focus these rays upon the retina. If the light is deficient, or if it comes from a wrong direction so that the shadow of the body falls upon the object (a book for example), it must of necessity be brought close to the eyes. Although the pupil is often unable to explain why he sees better if the object is brought within short range, yet he knows from experience that such is the case. The amount of light reflected from any given surface varies inversely as the square of the distance of the object, and hence if a book is held eight inches distant it reflects more than twice as much light upon the eye as if it were held twelve inches distant. Thus it will be seen that bringing the book close to the eyes is, in one respect, equivalent to increasing the amount of light. Aside from this, the size of the retinal image is increased if the object is brought nearer, and although the strain is greater, we frequently see far-sighted pupils bring the book close to the eyes. The result of this strain, which is intensified proportionally as the light is poor, is the exhaustion of nervous and muscular energy, in consequence of which the letters first begin "to blur," then "run together," and finally they can no longer be distinguished. After a few moments rest the work is again resumed, only to be again interrupted by the same tired feeling, the same blurring of the letters; and the pupil often becomes disheartened and discouraged, and votes school a humbug and study a bore. Nor is the tired feeling, the blurring of the letters, and the discomfort the only trouble arising in such cases; for if the optical defect, the insufficient light, and other bad influences are not remedied, congestions and inflammations may soon make their appearance, and any persistent effort to use the eyes only adds to the distress.

Even the emmetropic (natural) eye does not escape the ill effects of over-use, bad and insufficient light with poor ventilation, etc., and although the discomfort is trivial when compared with that experienced by the far-sighted individual, yet the difference is only one of degree, while many emmetropic eyes become myopic, or nearsighted, as numerous statistics will show.

But it is in myopia, with its attendant evils, that the worst results of school-life are to be seen, although they are by no means alarming in this country, when we compare them with the existing state of affairs in Germany.

From the examination of more than 25,000 school children and students both in this country and in Europe, it has been shown that near-sightedness increases to a very great extent during school-life.

Let us briefly consider what myopia is, what are its causes and what are its

effects. Near-sightedness, or myopia, indicates that condition of refraction in which parallel rays of light are not focused upon the retina but in front of it, in consequence of which there is no distinct vision for distant objects. This depends upon the excessive length of the eyeball, and such eyes are considered unhealthy, especially if the degree of shortsightedness is considerable.

To the oculist who is familiar with such cases, myopia indicates something more than the mere fact that only near objects are seen distinctly. With it are associated the conditions upon which the myopia depends, the anatomical and pathological changes which usually accompany it, and which predispose to a dangerous increase of the myopia itself. If the refractive error were the only trouble in shortsight, if there were no liability to its increase, and if there were no diseased conditions of the coats of the eye-ball, then might we consider myopia of slight importance.

Myopia may be either inherited or acquired, and the causes may be classed as predisposing and exciting. Very few, if any, children are near-sighted at birth, but there can be no doubt that a predisposition to short-sight is, in many instances, inherited. That certain physical conditions of the visual organs, and certain tendencies to disease of these organs are inherited, are facts well known to every oculist, for examples of this are met every day. The elongated eye-ball is no exception to this, for we frequently observe a marked tendency to near-sightedness in children born of near-sighted parents. Donders says that nowhere in Europe did he see relatively so many short-sighted people as in Germany, and in that country nearsightedness prevails among children to an extent not known in any other. Even the German children in this country exhibit the same tendency to myopia. Dr. Loring, in examining school-children in New York, found in the same schools and under the same circumstances that 24 per cent of the German pupils were myopic, while amongst the Americans there were 19 per cent, and amongst the Irish pupils only 14 per cent. But, while inheritance is, in some cases, a predisposing cause, other agencies play the more important role of exciting causes, and to those we will now turn our attention.

Chief among the exciting causes are close application to study at an early age while the tissues are lax and infirm, bad and insufficient light, tension of the eyes for near objects, prolonged use of the eyes without rest, congestion of the head, face and eyes from the stooping position, from tight clothing, or from cold feet, badly-printed books, the use of pale ink in writing, bad ventilation of school and living rooms, want of sufficient exercise in the open air, residence in large cities, and other influences which have a debilitating effect upon the system in general.

To me it would seem that modern school-life, especially in our large cities, furnishes most, if not all, of these causes; and we might correctly say that, improperly constructed and insufficiently and poorly lighted school buildings, too young attendance at school, and an imperfect system of education are the principal causes of myopia, both in this country and in Europe. In order to show more clearly the influence which modern school life exerts in the production of myopia, I shall introduce some statistics prepared by many able investigators both in this country and abroad. Dr. Cohn, of Breslau, Germany, examined more than 10,000 school children and students of different ages. In the village schools he found the percentage of myopic pupils to be only 1.4, while in the city schools among children of the same age, he found that more than ten per cent. were myopic, and in the highest grade of the city schools

the myopia had increased to the enormous rate of more than 63 per cent. The ratio for the respective years of school life was as follows:—

	Per Cent.		Per Cent.
First half-year.....	0.4	Seventh and eighth years.....	11.3
Second half-year and second year,	4.8	Ninth and tenth years.....	24.1
Third and fourth years.....	8.6	Eleventh and twelfth years.....	49.5
Fifth and sixth years.....	7.9	Thirteenth and fourteenth years.	63.3

In the schools of Königsberg, 3,036 children were examined by Dr. Conrad, who found that myopia gradually increased from the lowest class to the highest. The lowest class he designates as the eighth, and the highest as the first class. The per cent. of short-sighted pupils in the different classes was as follows:

	Per Cent.		Per Cent.
Eighth class (lowest).....	11.1	Fourth class.....	28.44
Seventh class.....	15.8	Third class.....	44.39
Sixth class.....	20.5	Second class.....	54.59
Fifth class.....	21.8	First class.....	62.1

In the schools of St. Petersburg, Dr. Erisman examined 4,358 pupils, ranging from eight to twenty years of age. These were from six grades or classes, and the per cent. of myopic pupils in each class was noted as follows:

	Per Cent.		Per Cent.
Preparatory class.....	13.6	Third class.....	30.7
First class.....	15.8	Fourth class.....	38.4
Second class.....	22.4	Fifth class.....	41.3

While the number of near-sighted pupils in the lowest class was remarkably large, and while more than one in eight of these children were handicapped at the very threshold of school-life with a diseased condition of their eyes, a condition always made worse by close application to study, yet in the highest grade the per cent. of myopic pupils was not nearly so great as was found by Cohn and Conrad in similar classes in Germany. The more rapid increase of near-sightedness in the schools of Germany than in the schools of St. Petersburg is a point worthy of consideration, and I regret that I have been unable to learn what causes gave rise to this difference in the ratio of its increase.

Three years ago Pflüger examined the school children of Lucerne, and according to his published reports the per cent. of near-sighted pupils was as follows:

	Per Cent.		Per Cent.
At seven years.....	0.0	Fifteenth year.....	26.0
Eighth year.....	2.0	Sixteenth year.....	30.0
Ninth year.....	3.0	Seventeenth year.....	43.0
Tenth year.....	6.0	Eighteenth year.....	55.0
Eleventh year.....	6.5	Nineteenth year.....	56.0
Twelfth year.....	6.0	Twentieth year.....	40.0
Thirteenth year.....	10.0	Twenty-first year.....	61.5
Fourteenth year.....	14.5		

These statistics are remarkable in that they show, with a single exception, a steady increase in the number of myopic pupils from the end of the first year at school, when no myopia was found, till the fourteenth year of school-life, when more than six out of every ten were near-sighted.

In the gymnasia of Vienna, Reuss observed that the number of near-sighted students nearly doubled in eight years. The per cent. in each of the eight classes was :

	Per Cent.		Per Cent.
First class.....	33.4	Fifth class.....	43.5
Second class.....	39.4	Sixth class.....	47.7
Third class.....	47.0	Seventh class.....	61.4
Fourth class.....	48.2	Eighth class.....	59.6

The apparent diminution in the per cent. of myopic students in the fifth, sixth, and eighth years should not mislead us, for none of the students were cured of their myopia, and it is more than probable that many students were obliged to abandon their studies in consequence of their myopia having reached a high degree. Dr. Reuss observed that the degree of myopia had materially increased in a majority of the cases in the space of three years.

The New York Medical Record of January 20, 1877, contains some remarks made by Professor C. R. Agnew, before the "Medico-Legal Society" of New York, regarding examinations for myopia, which had been instituted at his request in Cincinnati, Brooklyn, and New York city. These examinations were made by Drs. Ayers and Williams in the public schools of Cincinnati, by Drs. Prout and Matthewson at the Polytechnic in Brooklyn, and by Dr. Cheatham at the New York College. The following results were obtained:—

	Per Cent.		Per Cent.
<i>Public Schools of Cincinnati.</i>		<i>New York College.</i>	
District school.....	10.0	Preparatory department.....	29.0
Intermediate school.....	14.0	Freshman class.....	40.0
High school.....	16.0	Sophomore class.....	35.0
<i>Brooklyn Polytechnic.</i>		Junior class.....	53.0
Academic department.....	10.0	Senior class.....	37.0
Collegiate department.....	28.0		

Drs. Loring and Derby made careful examination of the pupils in the schools of New York city with a view of ascertaining the condition of refraction. Of the 2,265 cases examined they found that 3.5 per cent of the youngest pupils were myopic. These ranged from 6–7 years of age. Among the older pupils, those of 20 to 21 years, the per cent. of near-sightedness had risen to 26.78,—nearly eight fold.

This ratio of increase of myopia is equaled only by that observed in the schools of Breslau by Cohn, and by Pflüger in the schools of Lucerne.

My own investigations upon the subject of myopia among school-children includes the examination of about five hundred pupils. Over four hundred of these were in attendance at the Detroit high-school, where the course of studies is very thorough, and the others included both divisions of the lowest grade in one of the district schools. In the first division of the lowest grade were pupils who had been in attendance at school nearly four months, and who ranged from 6 to 7 years of age. In the second division were pupils who had about completed the first year at school, and whose ages ranged from 7 to 8 years. No myopia was found among the pupils of this grade. I regret that circumstances did not permit me to examine the pupils of the other grades in this school.

Of the pupils examined in the high-school the per cent. of myopia in each class was,—

	Per Cent.		Per Cent.
Ninth grade.....	9.0	Eleventh grade.....	10.0
Tenth grade.....	10.0	Twelfth grade.....	12.0

These examinations would tend to show that myopia does not prevail to a great extent among the pupils in the schools of Detroit, and that it increases from none in the lowest grade to 12 per cent in the highest during the twelve years' course of studies, that is, at the ratio of one per cent. yearly.

While this is a very favorable showing when compared with the statistics of other American cities, and while it is remarkably so when compared with the condition in the schools of Germany, yet it behooves us to use every precaution lest matters grow worse, which they certainly will as our city becomes more of a metropolis, unless we correct several existing defects in our school-buildings and in the manner in which the school-rooms are lighted. But of this I shall speak later.

From what has already been said, and from the data which have been furnished, it might naturally be inferred that myopia was peculiar to cultivated nations. That it is peculiar to cultivated nations is true, although the extent to which it prevails amongst a people cannot be taken as an index of their intellectuality.

Myopia does not prevail to a great extent in England, yet no one will maintain that the English are not a cultivated people, or that England has not produced her full quota of ripe scholars, fine poets, able dramatists, and men eminent in every department of art, literature, and science, men who have few equals and no superiors. On the other hand, we see that myopia is seldom met with in the rude uncultivated peoples of other countries. For example, Dr. Macnamara, formerly professor in the Calcutta Medical College, states that myopia is almost unknown among the lower classes of India. He informs us that a few years ago he availed himself of every opportunity to examine the eyes of the Southals, the aborigines of Bengal, but never met with a case of near-sightedness amongst them. "In fact," says Dr. Macnamara, "whole races appear to be actually strangers to this disease."

Dr. Callan examined several hundred colored children in the schools of New York, and found that only 3 per cent. of the pupils were myopic; and from the investigations of other observers it would appear that myopia is seldom met with among negroes. How then, shall we account for these apparent contradictions? that myopia is the result of close study, education, etc., that it is not found among the people of uncultivated countries, and that in cultivated England it prevails only to a slight extent. In regard to the infrequency of near-sightedness among the English, I think it susceptible of the following explanation: The English are fond of out-door sports, such as boating, football, cricket, and the like; and these healthful exercises, by keeping up the physical tone and vigor of the system, help to counteract the ill effect of school-life. Then, their books are well printed in good ink and with excellent type, matters of great importance.

We have, however, stronger arguments than mere statistics to show that myopia may be really and directly produced by close application to study when proper precaution is not taken to prevent its ill effects. Fortunately the observations of Erisman have furnished us with some important data upon this point. He noted that pupils in the same schools and under the same influ-

ences, who studied most, were most affected with near-sightedness. Of the 4,358 pupils examined by him, all studied two hours out of school, some studied four hours, some six, and others more than six hours. Of those who studied two hours, 17 per cent. were myopic; of those who studied four hours, 29 per cent.; and of those who studied six hours or over, more than 40 per cent. were myopic. How, then, do long hours of study, poor light, and other bad influences bring about this elongated condition of the eye-ball upon which the near-sightedness depends? During close application to study the eyes receive a greater supply of blood, and if this close application is long-continued the fluid contents of the eye become somewhat increased, the coats of the eye become congested, and a slight increase in the tension of the ball is apt to occur. To this is added the pressure of the muscles which converge the visual axes, and also the tension of the ciliary muscle, circumstances which of necessity accompany every effort to see near objects. Now if this is continued day after day, week after week, and year after year, before the tissues of which the eye-ball is composed have become sufficiently firm to resist these influences, a stretching and a thinning of the tunics of the eye and a consequent elongation of the ball occur. On account of the attachment of the muscles which move the eye, and on account of the relation of these muscles to the ball, the posterior part of the eye presents the point of least resistance, and when the stretching, bulging and elongation of the eye occur, it is always at the posterior pole. The nearer the object is brought to the eye the greater will be the strain of the ocular muscles, and the greater will be the pressure of some of these muscles upon the eye-ball, and the greater the tendency to its stretching and elongation. Now, if the light is deficient, or if it comes from such a direction that the shadow of the pupil's body falls upon the book or paper, he invariably brings it near that the eye may receive more light, as was explained in a preceding paragraph. Under such circumstances the pupil usually bends over, and as the stooping position prevents a free return of the blood from the head, face, and eyes, it favors the congestion of the eye already referred to. This congestion, often repeated and long continued, finally leads to certain pathological changes in the tunics of the eye, and as a result the myopia becomes progressive. These changes once begun tend to increase, particularly during youth and adolescence; and in rare instances they terminate in detachment of the retina from the choroid and total blindness of the victim. Donders, who is high authority, in speaking on this subject, says: "Not only is the near-sighted individual not in a condition to discharge all civil duties, not only is he limited in the choice of his position in society; but in the higher degrees, nearsightedness leads to disturbance of the powers of vision and threatens its subject with incurable blindness."

Now, what can be done to correct the ill effect which school-life exerts upon the visual organs? From what I have observed in our own city, where we are free from many of the injurious influences of larger places, where our schools will compare favorably with any in the land, and where the proportion of near-sighted pupils is comparatively small, I am convinced that much can be done and that many existing defects need correction. I will now call your attention for a moment to some things which I observed in the manner of lighting our schools, and to other defects which should be remedied. In most instances I observed that the light was insufficient. In some cases a portion of the light came from the back, and fell directly in the face of the teacher, and the shadow of the pupil's body covered the book or paper. In a few instances a portion of the light came from the front, and was a source of annoyance, as

well as of injury, to the pupil. In some very wide rooms light came from only one side, or from one side and from the rear, in consequence of which pupils seated farthest from the windows did not receive a sufficient amount of light. In every room which I entered, blackboards were placed between the windows, and in order to see these boards, the pupils were obliged to put themselves in a strained, uncomfortable position, while the light from the windows on either side of the blackboard came directly into the eyes. In most cases the lintels of the windows were too far from the ceiling, in some instances being about five feet below. In numerous instances the windows were too near the floor, and the light which fell below the desk was mostly lost.

The surface of window space rarely exceeded ten per cent of the floor surface, while in many instances it was not greater than six per cent, and in some cases it was even less than six per cent.

With two or three exceptions, the methods of ventilation were not the most approved, and in many instances the windows seemed to be the only means through which any ventilation could be secured.

I shall now attempt to answer the question, "What can be done to correct the ill effect which school-life exerts upon the visual organs?" In regard to light in the school-rooms, it should come from a proper direction, it should be abundant in quantity, and it should be pretty equally distributed to all parts of the room. Most of those who have given much thought and attention to the subject advocate the plan of lighting the room from the left side only, giving as a reason, that in writing, etc., the shadow of the hand does not fall upon the book, slate, or paper. This plan may seem correct in theory, but in practice you will find, as I did, that in wide rooms the pupils at the extreme right receive an insufficient amount of light. Javal, in a paper recently read before the Société de Biologie, advocated lighting the room from both sides, and my own observations convince me that this is the correct plan. According to Javal, the most recent investigations show that the per cent. of myopic pupils is much less in schools where the light is bilateral than where it is unilateral. He maintains that sufficient light from windows arranged upon one side of a room can only be obtained when the width of the room does not exceed the height of the windows. This is one extreme, and it is my opinion that a room whose width was equal to twice the height of the windows would be another extreme, and that between these limits we may secure good and sufficient light. Light coming from the rear is objectionable for two reasons: first, the shadow of the pupil falls upon his book or paper, and in this way much of the light is lost; and second, because the light from such a direction will usually fall upon the face of the teacher. Light from the front is the most objectionable, because the glare will prove irritating to the eyes of the pupil, and in order to avoid this irritation, he will bend the head downward, and, as was previously explained, the stooping position is decidedly a bad one. Light from above has certain objections, because the pupils who sit in front have a portion of it shut out by the shadow of their bodies, while the light falls more or less in the face of other pupils who sit at the rear end of the room.

As to the amount of light which should be admitted, all agree that it should be abundant without producing any glare. The area of window surface is what is generally taken as the basis of calculation, but that is not a correct index of the amount of light under all circumstances. Those most familiar with the subject hold that the surface of window should be equal to 30 or 50 per cent. of the surface of the floor. My own opinion is that much will depend upon the surroundings. In schools situated on broad streets, with no other

high buildings in the immediate vicinity, and in a pure atmosphere,—conditions prevailing very generally in Detroit,—a window surface equal to 30 per cent. of the surface of the floor of the room will usually be sufficient. In a smoky, foggy atmosphere, where high buildings are nearer than a distance equal to twice their height, or where the school-building is located in narrow, dingy streets, the window space should be greater than 30 per cent. of the surface of the floor.

The school-rooms should be oblong; the windows should be high, they should come close to the ceilings, and should be square at the top, for the most important part of the light comes from the top of the window. If shades are necessary to shut out a portion of the glaring light, they should be so arranged that they can be rolled from the bottom rather than from the top.

Javal favors placing the windows on the east side of the building, with the long axis of the building nearly north and south. This plan affords the advantage of the soft, mellow light of the eastern sky, and sufficient sunshine with its healthful influence, while the sun at mid-day does not shine directly into the room. Many prefer the diffuse light of the northern sky, which has no irritating effects upon the eye, and which is so pleasing to the artist; but unless the window surface is quite large, all parts of the room will not be sufficiently lighted, and the healthful influences of sunlight are lost.

Schools should be situated on spacious lots, and should be separate from all other buildings a distance equal to twice the height of the highest building in the vicinity. The walls of the school-room should not be a glazed white, for the light reflected from such a wall is likely to irritate the eye; and neither should they be very dark, for in such case too much of the light is absorbed. A faint neutral tint will be most grateful to the eye, particularly the greenish or the gray tint.

On account of the effect of impure air upon the eyes, if for no other reason, the school-room should be thoroughly ventilated; for an impure atmosphere, in addition to its irritating effect upon the visual organs, induces a feeble condition of the system and a laxity of tissue, and in this way acts as an indirect cause of myopia.

What has been said in regard to light, ventilation, etc., in the schools, applies with equal, if not greater, force to the homes of the pupils, for there can be no doubt that to the school-room is often laid the blame for injuries done at home. Erisman found that the greater the number of hours spent in study out of school, the greater was the per cent. of myopia.

Since myopia, which is the worst result of long hours of study, generally occurs before the age of twenty, and since comparatively few cases have their origin after the eighteenth year, the necessity for shortening the hours of study in early school life is apparent. After the eighteenth year the tissues are more firm and unyielding, and the tunics of the eye are better able to resist the injurious influences of close application to study.

The type, ink, and paper which are used in books are matters of great importance. In most American books an inferior quality of ink is used, and the letters are not as clear as those found in most English publications. The size of the type should not be less than one-sixteenth of an inch, or about the size of long primer. A faintly tinted yellow paper will be more agreeable to the eye than a glazed white, for the latter reflects so many rays of light that it is apt to prove irritating to the retina. Pale writing ink should never be used.

Another point to which I must call your attention, is the fitting of spectacles

for young children who are daily engaged in close study. Few people are aware that the spectacle-vender is wholly incompetent to correctly perform such a duty. Spectacles should never be fitted for children except by persons thoroughly competent, and particularly is this so in cases of myopia; for if an improper glass is given the near-sightedness may be increased, and serious injury may be done the eye, as I have seen in more than one instance.

In conclusion, I would add, by way of recapitulation, that if we would prevent, to a very great extent, the ill effect which school-life and close application to study exert upon the visual organs, the following rules should be observed:

1. Lessen the hours of study and shorten the sessions of study for pupils under fifteen years of age.

2. Provide an abundance of light, from the left side if the room is quite narrow, from both sides if the room is wide, but do not allow the sunlight to fall directly on the book or paper.

3. Ventilate the school-rooms thoroughly and in accordance with the most approved methods.

4. The pupil should sit erect, and should hold the book at least twelve inches distant.

5. Pupils should avoid whatever causes a congestion of the head, face, and eyes, such as tight clothing, cold feet, the stooping position, etc.

6. Pupils should not study during recovery from illness, or when suffering great bodily fatigue.

7. Text-books and readers should be printed in good ink and with a clear bold type, about the size of long primer, a little larger than one-sixteenth of an inch.

8. Pupils should avoid everything which has a debilitating effect upon the general system.

9. Exercise in the open air should be taken freely, and every precaution should be used to keep up the bodily vigor, something which is too often neglected. An education is dearly purchased whose price is a shattered constitution and a ruined eyesight.

